In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Previously Presented) A method of automatically focusing a microscope having a light source, an objective lens, a light path to direct incident light through the objective lens to be reflected by an object, an aperture to limit the spatial extent of the incident light and serve as an illumination pupil, a light path to direct at least some of the reflected light to an imaging system, and an imaging system to image the reflected light so directed, the method comprising: directing a beam of light from a light source through an objective of a microscope system to an object whereby light is reflected from the surface thereof; collecting at least some of the light reflected thereby and directing the same to an imaging system, wherein the incident beam of light is limited in spatial extent by imaging an aperture to form an illumination pupil, a centroid of illumination of the illumination pupil is aligned with an incident optical axis, and reflected light is projected to the imaging system in which the reflected light is split into at least two images from eccentric sections of an imaging pupil differentially displaced from the optical axis, and wherein the separation of the images thereby produced is determined to provide an indication of a focus condition.

2. (Original) The method of claim 1 wherein an illumination beam is injected into the top focal plane of the objective limited in its spatial extent and bounded by imaging an aperture so as to form an illumination in the top focal plane of the objective.

3. (Previously Presented) The method of claim 2 comprising the formation of a plurality of images of the object using sections of the imaging pupil with differing eccentricities and projecting the images onto a single imaging means within the imaging system.

4. (Previously Presented) The method of claim 3wherein the imaging means comprises a single detector array.

5. (Previously Presented) The method of claim 1, further comprising successively repeating actions to obtain separate pairs of images from eccentric sections of the imaging pupil, measurements of the separation of the successive pairs of images being used as part of iterative process to improve the accuracy of the focus condition.

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6. (Previously Presented) The method of claim 1 wherein the light source that is used to produce the light beam that is reflected and directed to the imaging system the same light source as used for metrology.

7. (Previously Presented) The method of claim 1 wherein a beam splitter is used to extract light reflected from the object and direct the same towards the imaging system and a primary observational optical system, the imaging system being separate from the primary observational optical system which is used to image the object, obtain metrology data or other measured data therefrom.

8. (Previously Presented) The method of claim 1 comprising investigating the focus condition and subsequently conducting observation and/or measurement of the object.

9. (Currently Amended) A ~~The~~ method of ~~claim 1,~~ automatically focusing a microscope having a light source, an objective lens, a light path to direct incident light through the objective lens to be reflected by an object, an aperture to limit the spatial extent of the incident light and serve as an illumination pupil, a light path to direct at least some of the reflected light to an imaging system, and an imaging system to image the reflected light so directed, the method comprising: directing a beam of light from a light source through an objective of a microscope system to an object whereby light is reflected from the surface thereof; collecting at least some of the light reflected thereby and directing the same to an imaging system, wherein the incident beam of light is limited in spatial extent by imaging an aperture to form an illumination pupil, a centroid of illumination of the illumination pupil is aligned with an incident optical axis, and reflected light is projected to the imaging system in which the reflected light is split into at least two images from eccentric sections of an imaging pupil differentially displaced from the optical axis, and wherein the separation of the images thereby produced is determined to provide an indication of a focus condition, the method further comprising using a dihedral mirror to split the imaging pupil into the at least two images formed on different sections of an imaging means within the imaging system.

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10. (Previously Presented) The method of claim 1 wherein a field stop is provided as the aperture to limit the spatial extent of the incident light in the beam of light from the light source.

11. (Canceled)

12. (Previously Presented) A microscope comprising:

a light source;

an objective lens and a first light path to direct incident light from the light source through the objective lens to be reflected by an object;

an aperture that limits the spatial extent of the incident light and serves as an illumination pupil with the centroid of illumination from the illumination pupil on an optical axis;

an imaging system and a second light path to direct reflected light from the object to the imaging system the imaging system comprising optics to split the reflected light into at least two images from eccentric sections of an imaging pupil differentially displaced from the optical axis, and a camera to measure the separation of the images thereby produced to provide an indication of a focus condition; and

a control system to adjust mechanically the separation of the object from the objective lens.

13. (Previously Presented) A microscope in accordance with claim 12 wherein the imaging system is provided to determine optimal focus position in a first focusing step, the microscope comprising a second imaging system for subsequent observational step, and a beam splitter disposed between the imaging system and the second imaging system to divert reflected light from the object partially to both the imaging system and the second imaging system.

14. (Previously Presented) A microscope in accordance with claim 12 wherein the optics to split the reflected light into at least two images from eccentric sections of the imaging pupil comprises a dihedral mirror.

15. (Canceled)

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16. (Previously Presented) The method of claim 5, further comprising obtaining the focus condition varying spatially across an object to determine a degree of deviation from planarity.

17. (Previously Presented) A microscope in accordance with claim 12 wherein the imaging system is provided to determine optimal focus position in a first focusing step, the microscope comprising a second imaging system for subsequent observational step, and selective optics disposed between the imaging system and the second imaging system to divert reflected light from the object selectively to either the imaging system or the second imaging system.

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